

Amendment under 37 C.F.R. §1.312
Application No. 10/816,955
Attorney Docket No. 042322
Date Response Filed: May 2, 2007

AMENDMENTS TO THE CLAIMS

This listing of claims replaces all prior versions and listings of claims in the application.

1. (Previously presented) A semiconductor device comprising:
 - a first inter-layer insulation film formed over a substrate and including a first low dielectric constant film whose dielectric constant is lower than that of silicon oxide and a hydrophilic insulation film formed on the first low dielectric constant film;
 - a first interconnection layer buried in a first interconnection trench formed in the first inter-layer insulation film, whose minimum interconnection pitch is a first pitch;
 - a second inter-layer insulation film formed over the first inter-layer insulation film and including a second low dielectric constant film whose dielectric constant is lower than that of silicon oxide;
 - a second interconnection layer buried in a second interconnection trench formed in the second inter-layer insulation film, whose minimum interconnection pitch is a second pitch larger than the first pitch; and
 - a diffusion preventing film formed directly on upper surfaces of the second low dielectric constant film and the second interconnection layer, without any hydrophilic insulation film between the second low dielectric constant film and the diffusion preventing film.

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2. (Original) A semiconductor device according to claim 1, further comprising:

a third inter-layer insulation film formed over the second inter-layer insulation film and including an insulation film having a dielectric constant higher than the first low dielectric constant film and the second low dielectric constant film; and

a third interconnection layer buried in a third interconnection trench formed in the third inter-layer insulation film, whose minimum interconnection pitch is a third pitch larger than the first pitch and the second pitch.

3. (Original) A semiconductor device according to claim 1, further comprising a diffusion preventing film formed directly on the hydrophilic insulation film and the first interconnection layer.

4. (Original) A semiconductor device according to claim 2, further comprising a diffusion preventing film formed directly on the hydrophilic insulation film and the first interconnection layer.

5. (Original) A semiconductor device according to claim 1, wherein the second pitch is 1.5 or more times the first pitch.

6. (Original) A semiconductor device according to claim 2, wherein the second pitch is 1.5 or more times the first pitch.

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7. (Original) A semiconductor device according to claim 1, wherein the low dielectric constant film is an SiOC film, a SiLK film, a BCB film, a FLARE film or a porous silicon oxide film.

8. (Original) A semiconductor device according to claim 1, wherein the interconnection layer is buried in a via hole formed in the inter-layer insulation film and in the interconnection trench formed in a region of the inter-layer insulation film, which includes the via hole.

9. (Original) A semiconductor device according to claim 1, wherein a main material of the interconnection layer is Cu or Al.

10. (Previously presented) A semiconductor device comprising:
a first multilayer interconnection layer formed over a substrate and including a plurality of interconnection layers whose minimum interconnection pitch is a first pitch, at least one of said plurality of the interconnection layers being buried in an opening formed in a first inter-layer insulation film including a first low dielectric constant film whose dielectric constant is lower than that of silicon oxide and a hydrophilic insulation film formed on the first low dielectric constant film; and

a second multilayer interconnection layer formed over the first multilayer interconnection layer and including a plurality of interconnection layers whose minimum interconnection pitch is a second pitch larger than the first pitch, said plurality of the interconnection layers being buried

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in openings formed in a plurality of second inter-layer insulation films each including a diffusion preventing film and a second low dielectric constant film whose dielectric constant is lower than that of silicon oxide, the second low dielectric constant film being formed on the diffusion preventing film, the respective openings being formed in the respective second inter-layer insulation films, the respective interconnection layers being buried in the respective openings,

and

the diffusion preventing film of one second inter-layer insulation film being formed directly on an upper surface of the second low dielectric constant film of another second inter-layer insulation film underlying said one second inter-layer insulation film and an upper surface of the interconnection layer buried in said another second inter-layer insulation film, without any hydrophilic insulation film between the second low dielectric constant film of said another second inter-layer insulation film and the diffusion preventing film of said one second inter-layer insulation film.

11. (Original) A semiconductor device according to claim 10, further comprising
a third multilayer interconnection layer formed over the second multilayer
interconnection layer and including a plurality of interconnection layers whose minimum
interconnection pitch is a third pitch larger than the first pitch and the second pitch,
the plurality of interconnection layers forming the third multilayer interconnection layer
being buried in an opening formed in a third inter-layer insulation film including an insulation

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film of a higher dielectric constant than the first low dielectric constant film and the second low dielectric constant film.

12-20. (Canceled)

21. (Currently amended) A semiconductor device comprising:

a first inter-layer insulation film formed over a substrate and including a first low dielectric constant film whose dielectric constant is lower than that of silicon oxide and a hydrophilic insulation film formed on the first low dielectric constant film;

a first interconnection layer buried in a first interconnection trench formed in the first inter-layer insulation film, whose ~~minimum~~ interconnection pitch is a first pitch;

a second inter-layer insulation film formed over the first inter-layer insulation film and including a second low dielectric constant film whose dielectric constant is lower than that of silicon oxide;

a second interconnection layer buried in a second interconnection trench formed in the second inter-layer insulation film, whose interconnection pitch is a second pitch larger than the first pitch; and

a diffusion preventing film formed directly on upper surfaces of the second low dielectric constant film and the second interconnection layer, without any hydrophilic insulation film between the second low dielectric constant film and the diffusion preventing film.

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22. (Previously presented) A semiconductor device according to claim 21, further comprising:

a third inter-layer insulation film formed over the second inter-layer insulation film and including an insulation film having a dielectric constant higher than the first low dielectric constant film and the second low dielectric constant film; and

a third interconnection layer buried in a third interconnection trench formed in the third inter-layer insulation film, whose interconnection pitch is a third pitch larger than the first pitch and the second pitch.

23. (Previously presented) A semiconductor device comprising:

a first multilayer interconnection layer formed over a substrate and including a plurality of interconnection layers whose interconnection pitch is a first pitch, at least one of said plurality of the interconnection layers being buried in an opening formed in a first inter-layer insulation film including a first low dielectric constant film whose dielectric constant is lower than that of silicon oxide and a hydrophilic insulation film formed on the first low dielectric constant film; and

a second multilayer interconnection layer formed over the first multilayer interconnection layer and including a plurality of interconnection layers whose interconnection pitch is a second pitch larger than the first pitch, said plurality of the interconnection layers being buried in openings formed in a plurality of second inter-layer insulation films each including a diffusion preventing film and a second low dielectric constant film whose dielectric constant is lower than

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that of silicon oxide, the second low dielectric constant film being formed on the diffusion preventing film, the respective openings being formed in the respective second inter-layer insulation films, the respective interconnection layers being buried in the respective openings, and

the diffusion preventing film of one second inter-layer insulation film being formed directly on an upper surface of the second low dielectric constant film of another second inter-layer insulation film underlying said one second inter-layer insulation film and an upper surface of the interconnection layer buried in said another second inter-layer insulation film, without any hydrophilic insulation film between the second low dielectric constant film of said another second inter-layer insulation film and the diffusion preventing film of said one second inter-layer insulation film.

24. (Previously presented) A semiconductor device according to claim 23, further comprising

a third multilayer interconnection layer formed over the second multilayer interconnection layer and including a plurality of interconnection layers whose interconnection pitch is a third pitch larger than the first pitch and the second pitch,

the plurality of interconnection layers forming the third multilayer interconnection layer being buried in an opening formed in a third inter-layer insulation film including an insulation film of a higher dielectric constant than the first low dielectric constant film and the second low dielectric constant film.